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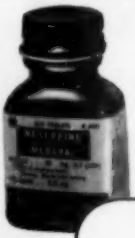

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AMERICAN JOURNAL OF PHARMACY

AND THE SCIENCES SUPPORTING PUBLIC HEALTH

Since 1825

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E D I T O R I A L

SHOULD A. PH. A. MEMBERSHIP BE RESTRICTED?

ONE of the resolutions presented at the Interim Meeting of the A. Ph. A. House of Delegates was that the Council take action terminating representation of one of our trade associations in the House of Delegates. Action on this resolution was deferred until the April 1957 meeting. It is not our purpose here to discuss the reasons behind this resolution nor to debate its relative merits but rather to discuss the whole problem of the required qualifications for membership in the A. Ph. A.

One of the things which disturbs many of those who strongly endorse membership in the A. Ph. A. and would like to see this organization speak with greater force and authority for pharmacy is the unbelievably small number of pharmacists in America who are members. There seems to be no real hope for organized pharmacy to meet all of its important objectives unless this top professional organization can point to a total membership of at least 100,000. At this moment, such a day seems far off indeed.

It is easy to offer all sorts of excuses in an attempt to explain the poor representation of pharmacists in the A. Ph. A. and to blame it on the irresponsibility and lack of interest on the part of pharmacists themselves. When one reflects on this problem for a time and does so objectively, there is at times a lurking suspicion that the fault lies not exclusively with the apathy of pharmacists. Actually, one feature of the A. Ph. A. may underlie much of its weakness.

In attempting to make the A. Ph. A. the broad, representative group which it is supposed to be, the qualifications for active, voting membership are placed ridiculously low. Actually, anyone—pharmacist or not—can become an active member of the A. Ph. A. providing he makes application, is willing to pay the fee, and receives the necessary endorsement of two active members. While the Council is supposed to carefully screen the qualifications of non-pharmacists who apply for membership, there is considerable doubt as to the effectiveness of such screening. We would be willing to wager that it would be a relatively simple thing for one to get full, active membership for a five year old boy with a little skillful maneuvering! In the House of Delegates itself, certain groups are given accredited delegates when it

is obvious that, at times, their interests are diametrically opposed to those of practicing pharmacists. Such was the situation leading to the recent resolution asking that a trade association be barred from representation in the House.

The A. Ph. A. we believe is the only professional organization in all of the health sciences which does not restrict its membership to those who are duly qualified to practice that profession. For example, it matters not how closely related one is to the practice of medicine, he cannot be a member of the American Medical Association unless he is a physician. It is our opinion that human beings, by and large, are not likely to appreciate or enjoy a privilege which is easy to obtain and extended to all, and that the more restricted and exclusive membership in an organization is the more highly it is prized. There is also serious doubt whether the A. Ph. A. can properly represent all of the polyglot interests which make it up and, herein, may lie the source of much of its impotence in dealing with problems before it. This may also explain the rather surprising strength and cohesiveness of certain other groups which do have homogeneity of membership and uniformity of interests. They solve the problem of an exclusive active membership by an associate membership offered to others who wish to participate in their program but who cannot meet certain qualifications. Is it not possible that the A. Ph. A. should raise its own criteria for membership rather than welcome all comers with open arms?

We suspect that this question we have raised will meet with something less than enthusiasm on the part of those who presently guide the affairs of the A. Ph. A. Such is the risk which everyone must take when established patterns of thought, steeped in long years of tradition, are challenged. This question is raised, however, not in the sense of destructive criticism but by one who has been a member for over a quarter of a century and who believes that the American Pharmaceutical Association deserves the support of every pharmacist. An A. Ph. A. with an active membership made up exclusively of pharmacists, financed exclusively by pharmacists, and operated with their professional interests as its sole objective might command that support which would soon make our present and ofttimes ineffectual position a matter of historical record. Is it not possible that the profession of pharmacy has reached sufficient maturity to make this not only advisable but an absolute necessity?

L. F. Tice

SOME IMPORTANT DRUG DEVELOPMENTS OF 1956

By L. F. Tice

Within the past year, many important new advances have been made in medicinal agents. In this review, we have tried to place these new developments in proper perspective as they fit into well-established therapy. More and more, the pharmacist is called upon to inform and advise the other health professions on new drugs. He must, therefore, keep abreast of new therapeutic agents to render this important service.

Ataractic Drugs

THE widespread success and use of tranquilizing agents has encouraged great activity in developing drugs in this category. While reserpine and chlorpromazine continue to be the most widely used in psychiatric wards of hospitals, others seem to be equally useful in many ambulant patients seen by the physician. The existence of fear, anxiety, and tension can either be the source of many physical ailments or greatly intensify them.

Meprobamate (Miltown—Wallace Laboratories; Equanil—Wyeth) has had wide clinical acceptance. It is the dicarbamate of 2-methyl-2-*n*-propyl-1,3 propanediol. It is not too far removed in structure from the muscle relaxant mephenesin but is much more potent as a tranquilizer.

Phenothiazine Derivatives

This last year, a close relative of chlorpromazine was released by Wyeth as Sparine. It is identical in structure to chlorpromazine (Thorazine—S. K. F.) except for the absence of chlorine at position 2 of the phenothiazine nucleus. It is also considered likely that the well-known antihistamine Phenergan, which is isomeric with promazine, has definite ataratic properties and may soon be recommended for such use. It differs only in having an isopropyl group between the dimethyl amine and the phenothiazine nucleus in place of a normal propyl as in promazine and chlorpromazine.

A companion product to chlorpromazine has been released and described by the generic name prochlorperazine (Compazine—S. K. F.). It differs only in having a 1-methyl-4-piperazine ring attached at the end of the three carbon propyl chain in place of a dimethyl amino group. It is somewhat weaker than Thorazine but less toxic and more adapted for general clinical use.

Other Drugs

The drug Hydroxyzine (Atarax—Pfizer) is somewhat related to the antihistamine chlorcyclizine and the anti-nauseant Bonamine (Pfizer). Atarax is 1-(p-chlorobenzhydryl)-4-[2-(2 hydroxyethoxy) ethyl] diethylene diamine. Since diethylene diamine is another way of expressing piperazine, it too is a piperazine derivative. Atarax is being extensively used clinically for widely diversified conditions responding to therapy with these agents. In combination with prednisolone (Ataraxoid—Pfizer), it helps control the apprehension and anxiety in rheumatoid arthritis and serious allergic states during steroid therapy.

The drug Azacyclonal (Frenquel—Merrell) is α-4-piperidyl benzhydrol hydrochloride. It is not a tranquilizer for general use but seems specifically applicable in schizophrenia and post-alcoholic states accompanied by visual and auditory hallucinations. It also seems to prevent experimentally induced hallucinosis using either lysergic acid diethylamide (LSD-25) or mescaline. It is of interest to note that an isomer of Azacyclonal (a 2 piperidyl derivative instead of a 4 piperidyl), which is known as pipradol (Meratran—Merrell), is a central stimulant having the advantage over amphetamine in having little action on the autonomic nervous system.

An ataractic, 2-ethylcrotonylurea (Nostyn—Ames) is a very recent addition to the field. It is claimed both effective yet with little side effects.

Other ataractic drugs soon to be released are Pacatal—Warner-Chilcott and Suavtil—Merck Sharp & Dohme.

Reserpine Side-Effects

The long continued use of reserpine is sometimes accompanied by serious depression. This may be so severe that electroshock therapy is required. It is now believed that, in cases not requiring intensive therapy, the amount of reserpine given daily over a pro-

longed period of time should not exceed 0.25 mg. Some authorities feel that the combination of a central stimulant with reserpine is advisable. Such a combination is one containing 0.1 mg. of reserpine and 10 mg. of methyl phenidyl acetate. It is sold as Serpatilin (Ciba). The central stimulant in this combination is also supplied by Ciba as Ritalin. While it is not as potent as amphetamine, it does not influence the cardiovascular system.

Reserpine is also known to increase gastric motility and secretion and this side effect may be a serious one in patients with a history of gastric ulcer.

Antibiotics

A number of new antibiotics have been released in recent months. One such drug is cycloserine isolated from cultures of *Streptomyces orchidaceus* and *Streptomyces garyphalus*. Its structure has been established as D-4-amino-3-isoxazolidinone and it can be synthesized from the amino acid serine.

Cycloserine is of value particularly in the treatment of tuberculosis when the organism has acquired resistance to the usual tuberculostatic drugs. It is probably best to administer it with isoniazid. If excessively high blood levels are attained, convulsive seizures may result as a toxic effect. This drug is available as Oxamycin (Merck Sharp & Dohme) and as Seromycin (Lilly).

Novobiocin

This new antibiotic was isolated from three different sources by independent workers. Merck Sharp & Dohme obtained it from *S. spheroides* and named it Cathomycin. The Upjohn Company isolated it from *S. niveus* and gave it the name Albamycin. It was also isolated and described by Pfizer as Cardelmycin. Workers at the Food and Drug Administration in Washington established that it was the same substance.

Novobiocin is particularly useful in combatting drug resistant staphylococcic infections. Such resistant infections seem to be increasing, particularly among patients in a hospital environment and it is believed that medical and nursing personnel often serve as immune carriers with the staphylococci (*Micrococcus pyogenes*) present in the nasopharynx.

The combination of novobiocin with penicillin increases its efficiency. Such combinations are sold as Cathocillin (Merck Sharp & Dohme) and Alba-Penicillin (Upjohn).

Oleandomycin

Another antibiotic having outstanding activity against many pathogenic organisms including resistant staphylococci is Oleandomycin, originally known as PA-105. This is available as Matromycin (Pfizer) and also in combination with tetracycline as Sigmamycin (Pfizer). The latter combination is much more effective than either antibiotic alone and the likelihood of organisms acquiring resistance during therapy is reduced. Sigmamycin is claimed to be a synergistic combination and in accord with current trends in antibiotic therapy wherein combinations of certain antibiotics are preferred to single drugs.

A combination of oleandomycin and neomycin also has been found valuable in gut sterilization preceding surgery and to produce almost no side effects.

The combination of mycostatin and neomycin is now offered in ointment form by Squibb. Since many external infections are mixed fungous and bacterial, this combination should be useful.

Still another antibiotic effective against resistant staphylococci is Vancomycin (Lilly) which is currently under clinical investigation.

At the fourth annual Antibiotics Symposium, four new antibiotics were described: ristocetin, PA-132, nucleocidin and alazopeptin. Ristocetin is effective against gram positive organisms but also the tubercle bacillus. Ristocetin was found to be bactericidal rather than bacteriostatic and to have a low order of toxicity.

Antibiotics in Preservation of Meat

The broad spectrum antibiotics belonging to the tetracycline group have been found to have great economic value in preventing spoilage of meat, poultry, and fish. Only very minute amounts are needed. In the case of meat, animals receive an injection of the drug a short time before slaughtering. The drug infuses the tissues and spoilage is greatly delayed. Surface spoilage and discoloration can be prevented by simply spraying the meat with a dilute solution.

The preservation of poultry is accomplished by adding the antibiotic to the water in the chill tanks and fish are preserved by adding

it to the water later frozen into ice. This ice is then used on shipboard and in the transport of the fish to market.

The amount of the tetracycline is so small that it poses no health hazard and cooking destroys even this small residue. This new development in food preservation may well revolutionize many of our food industries and food practices.

Steroids

The delta 1 unsaturated steroids prednisone and prednisolone have continued to gain in popularity with the medical profession as anti-inflammatory compounds. They are more potent than their parent compounds cortisone and hydrocortisone respectively and they seem in therapeutic doses to cause fewer side effects such as sodium retention.

A number of products combining small doses of these steroids with acetylsalicylic acid have also been released. Such a combination is often satisfactory in treating the less severe rheumatic and inflammatory conditions. Examples of such products are Cordex (Upjohn) and Sigmagen (Schering). These steroids are also effective when used topically and combinations with anti-infectives and antihistamines are available for use in the nose, on the skin, etc.

A close relative of prednisolone is 6-methyl Δ_1-hydrocortisone (Medrol—Upjohn). This steroid is claimed more potent than prednisone or prednisolone and to produce even less sodium and water retention.

A water soluble form of hydrocortisone is now used in certain topical products. It is hydrocortisone dieethylaminoacetate hydrochloride. Combined with neomycin sulfate in ointment form it is supplied as Neo-Magnacort Ointment (Pfizer).

While the adrenal steroids by themselves are contra-indicated in tuberculosis, they have been reported to be of value when combined with appropriate antibiotic therapy. Such combinations are not only useful in many acute cases but in chronic cases, such therapy helps in making the patient non-infectious to others.

9α halo Derivatives

The introduction of a halogen atom on carbon 9 and in the trans position potentiates certain steroids. The 9α-fluoro derivative of

hydrocortisone is much more potent than its parent substance but, unfortunately, its mineralocorticoid activity is also potentiated and, when used in inflammatory diseases, sodium and water retention is a side effect. It is of value in treating the Addisonian patient, acting like a combination of hydrocortisone and desoxycorticosterone. Topically, it is very useful for its anti-inflammatory action and it is used in several preparations such as ointments and lotions. It is known as Florinef (Squibb), F-Cortef (Upjohn), and Aflorone (Merck Sharp & Dohme). The 2-methyl derivative of 9α-fluorohydrocortisone has been reported to be three times as active as aldosterone in mineralocorticoid activity. Before this report, aldosterone (-CHO at position 18 instead of CH_3) was the most potent substance known.

The potentiation of the androgen testosterone also takes place when fluorine is present in the 9α position. Halotestin (Upjohn), 9α-fluoro methyltestosterone, is presently on clinical trial.

Long-Acting Sex Hormones

A number of products are now available giving a long duration of action with estrogens, progestins, and androgens. The most recent of these is Estradiol cyclopentylpropionate (Depo-Estradiol—Upjohn), 17α-hydroxy progesterone caproate (Delalutin—Squibb), Testosterone cyclopentylpropionate (Depo-Testosterone—Upjohn), Testosterone Enanthate (Delatestryl—Squibb), and Testosterone Phenylacetate (Perandren Phenylacetate—Ciba).

Androgen-Estrogen Combinations

The use of properly balanced combinations of androgens and estrogens continues to gain favor. Such combinations are of value not only in the menopausal syndrome but in many other directions.

The observation that estrogens have some prophylactic effect in preventing atherosclerosis has led to the use of such substances in geriatric formulas such as vitamin mineral combinations. Estrogens alone are not as well suited for such use as an androgen-estrogen combination. The androgen offsets the side effects of estrogen and the anabolic action of the androgen is helpful. Such combinations also seem to delay the onset of osteoporosis which in the elderly is often both painful and incapacitating.

Anabolic Steroid

A number of steroids related to testosterone have a tissue building (anabolic) effect including testosterone itself. In many cases, the anabolic effect is desired with minimal androgenic activity. The latest among several such compounds is nor-17α-ethyl testosterone (Nilevar —Searles). This compound lacks a methyl at position 19 but has an ethyl group in the trans position on carbon 17.

Phytosterols

The problem of atherosclerosis is a serious one in those countries where a rich diet is commonplace. While the etiology of this disease is still obscure, much is known about it such as the role of animal fats in its developments. In patients with atherosclerosis, a certain sized species of lipoprotein particle is found in the blood and there is usually associated with it a relative hypercholesterolemia. The elimination of cholesterol in the diet is difficult but, even so, it can be made endogenously using simple molecules such as acetates.

The oral administration of certain plant sterols seems to retard the absorption of dietary cholesterol and also retards the reabsorption of endogenous cholesterol present in the intestine via the bile. A preparation containing a 20% suspension of beta and dihydrobeta-sitosterols is supplied as Cytellin (Lilly). It is administered orally to reduce hypercholesterolemia in those cardiovascular diseases associated with or caused by atherosclerosis.

Sulfonamides

Among the several sulfonamides used in urinary infections, sulfisoxazole (Gantrisin—Roche) and sulfamethylthiadiazole (Thiosulfil—Ayerst) are well-known. A number of products have been released recently combining one of these sulfonamides with 2,6-diamino-3-phenylazopyridine hydrochloride. The latter substance, a well-known urogenital analgesic helps allay the pain and discomfort common in urinary infections. Products of this type are: Azo-Gantrisin (Roche), Urosulfin (Nepera), Thiosulfil A (Ayerst), and Suladyne (Stuart).

The sulfonamide hypoglycemic agents 1-butyl-3-p-sulfanilylurea (Carbutamide—Lilly) and 1-butyl-3-p-tolylsulonylurea (Orinase—Upjohn) have undergone extensive clinical testing in diabetes. Lilly

recently discontinued clinical tests on Carbutamide because of a rather frequent report of toxicity. The other compound, Orinase, is still under investigation.

Analgesics and Antitussives

The synthesis of *dl*-3-hydroxy-N-methyl morphinane (Dromoran—Roche) was an important accomplishment since it provided a morphine-like substance without a dependence on opium as a source. The *l*-isomer of this is the component of the racemic mixture having good analgesic activity. Actually, the *d*-form inhibits the action of the *l*. In view of this, the *l*-isomer is now sold as a potent analgesic under the name Levorphan Tartrate (*l*-Dromoran—Roche).

The methyl ether of the *d*-form is a very useful antitussive and is sold in both tablet and syrup form as Romilar (Roche). The N-allyl analogue of *l*-Dromoran; namely, *l*-3-hydroxy-N-allylmorphinane is available as Lorfan Tartrate (Roche). It is used in combatting respiratory depression caused by morphine, methadone, and meperidine particularly when the analgesic effect is desired and respiratory depression is harmful such as in obstetrics. This compound is closely related to the morphine antagonist Nalline (Merck Sharp & Dohme) which is N-allyl-nor morphine, the latter differing from Lorfan only in having an alcoholic OH, an oxygen bridge and an additional double bond (as does morphine). It is the presence of the allyl group (C_3H_5) on the nitrogen in place of a methyl in both Lorfan and Nalline which causes the morphine antagonism. Lorfan is claimed to reduce the analgesic action of morphine less than does Nalline while blocking respiratory depression just as effectively. Both are useful in combatting morphine overdosage.

Narcotine

One of the non-narcotic alkaloids of opium is the isoquinoline derivative, narcotine. This has come into prominence recently as an antitussive which does not cause respiratory depression as do morphine and codeine and it is not habit forming. Its solubility in water makes it unsuitable for cough syrup formulation, but it can be used in tablet or capsule form. Two new dosage forms of narcotine are Consol (Merrell) which is a thixotropic suspension and Consolets (Merrell), a troche form. Both contain narcotine, the antihistamine Decapryn, and terpin hydrate.

Amebicides

Intestinal amebiasis is more widespread than generally believed and its effective treatment has always been difficult. Many drugs are useful in intestinal amebiasis including certain iodinated hydroxyquinoline derivatives, organic arsenic compounds, and the organic arsenic and bismuth compound Milibis (Winthrop). Liver involvement, while once treated almost exclusively with emetine, is now best treated with chloroquin diphosphate (Aralen—Winthrop).

Recently, two new amebicides for the intestinal form of amebiasis have been released. One, Arsthinol (Balarsen—Endo Products), was originally developed for the treatment of yaws but was found to be quite effective in amebiasis. A single dose daily for 5-7 days gives a very high per cent of cures based on stool examination 4-6 weeks later.

The second amebicide recently announced is Camoform (Parke-Davis). This is the dihydrochloride of 6,6′-diallyl α, α′-bis-(diethylamino) 4,4′-bi-*o*-cresol. It, too, has been reported as very effective in ridding the intestinal tract of *Endamoeba histolytica*.

Fecal Softener

A wetting agent long used in pharmacy and for many technical purposes has received considerable attention for use in certain types of constipation. This substance, dioctyl sodium sulfosuccinate (Aerosol OT—Carbide and Carbon) acts as a fecal softener rather than by intestinal irritation. It can be given in capsule form in a dose of 20-120 mg. a day and liquid preparations are also available. Several products containing this substance are now marketed including Colace (Mead Johnson), Doxinate (Lloyd Brothers), Diovac (Gray), and Molofac (Squibb).

Ganglionic Blocking Agents

The use of ganglionic blocking agents in the control of hypertension is a well-established regimen of therapy. In addition to the hexamethonium salts and pentolinium tartrate (Ansolysen—Wyeth), two new drugs in this category have been released. One such drug is mecamylamine hydrochloride (Inversine—Merck Sharp & Dohme). It is given orally beginning with 2.5 mg. twice a day with the dosage gradually and carefully increased until the desired response is obtained.

Another ganglionic blocking agent is chlorisondamine chloride (Ecolid chloride—Ciba). It is used in severe and malignant hypertension. The initial dose is 25 mg. on the first morning. The second day, a morning dose and an evening dose of 25 mg. are given. The dose is then increased very carefully until the desired effect is produced.

Muscle Relaxants

The use of drugs of the mephenesin type for muscle pain and spasm is often quite effective. A new drug in this class is Zoxazolamine (Flexin—McNeil). It is claimed to relieve skeletal muscle spasm without interfering with normal muscle power or activity, its action being primarily at the internuncial neurons in the spinal cord and subcortical area. It is prescribed in low back pain, fibrositis, spondylitis, rheumatoid arthritis, spasticity states, palsy, and Parkinson's disease. Since the drug is often irritating to the stomach the best form for its administration is as enteric tablets supplied as Flexin-Engestic—McNeil.

Another muscle relaxant specifically useful in Parkinson's disease is Procyclidine hydrochloride (Kemadrin—Burroughs Wellcome). Chemically, this is 1-cyclohexyl-1-phenyl-3-pyrrolidino-propan 1-ol hydrochloride.

Cholinesterase Inhibitor

The control of myasthenia gravis requires a long acting anticholinesterase drug with minimal side effects. A new drug, ambenonium chloride (Mytelase chloride—Winthrop) is claimed to be the best drug yet developed for this purpose. It is longer acting than most so that medication during the night is avoided. Muscular weakness is relieved after 15-20 minutes following an oral dose and the effect lasts at least 4 hours. The dose varies with the individual patient from 5-75 mg.

Trichomonacide

The eradication of *Trichomonas vaginalis* in the vaginitis which it causes is difficult using only topical therapy. Reinfection often follows since these protozoa are harbored in the prostate of the male. A new drug claimed to be effective orally in both males and females is 2-acetylamino-5-nitrothiazole (Tritheon—Ortho Products). This is given orally in the form of 100 mg. tablets, three times a day, for 10 days.

Urographic Medium

A new contrast medium for intravenous urography is sodium and methylglucamine diacetylamino-triiodobenzoates sold in the form of a 20 ml. ampul as Renografin (Squibb). It is claimed to give excellent opacifications within 5-15 minutes after intravenous injection. As with all organic iodine compounds, the patient is first tested for sensitivity to the drug and, for this purpose, a small separate ampul is packaged with the larger one.

Diuretic

A new potent non-mercurial diuretic has been announced. This product aminoisometradine (Rolicton—Searle) is 1-methallyl-3-methyl-6-aminotetrahydropyrimidinedione. It is used in correcting the edema of congestive heart failure, hepatic cirrhosis, in nephrosis, glomuleronephritis, and the toxemia of pregnancy. It is not recommended for the initial diuresis in severe congestive heart failure but in maintaining the patient edema free once under control. Rolicton is supplied as 400 mg. tablets. The initial dose is 4 tablets a day and then a maintenance dose of two a day.

Anticoagulant

A new potent yet easily controlled prothrombin depressant has been released under the name Dipaxin (Upjohn). Chemically, it is 2-diphenylacetyl-1,3-indandione. It is recommended for oral use in various cardiovascular diseases.

Miscellaneous

The use of Promacetin (Parke-Davis), a drug used in leprosy, has given results as good as or better than sulfapyridine in dermatitis herpetiformis and it is much less toxic.

Quinacrine (Atabrine—Winthrop), a drug with very unusual therapeutic uses in addition to its use as an antimalarial, has been found of value in infectious mononucleosis, according to a recent report.

The presence of glucose in the urine can now be detected using a test paper known as Clinistix (Ames) and Tes-Tape (Lilly). Both simply require dipping in a urine sample and noting change of color.

The latter is claimed to be roughly quantitative as well as a qualitative test. The test papers are impregnated with the enzymes glucose oxidase and peroxidase which, in the presence of glucose, change the paper from yellow to green and then blue depending upon the amount of glucose present.

A drug to depress the appetite in obesity acting much like amphetamine or desoxyephedrine has been released under the name Preludin (Geigy). It is phenyl-methyl-tetrahydro-oxazine hydrochloride. It is claimed to have minimal side effects such as overstimulation.

The potassium salt of *p*-aminosalicylic acid is claimed to produce less gastric disturbance than the sodium salt when used in tuberculosis therapy. It is available as Paskate Pulvules (Lilly), each containing 0.5 Gm.

The unique aerosol apparatus devised by Riker Laboratories as Medihaler is now adapted for the administration of Octyl Nitrite, a potent rapid vasodilator. This is in addition to a similar aerosol product containing epinephrine, Medihaler-Epi (Riker), and Medihaler-Iso (Riker) which contains isopropylarterenol.

The widepread acceptance of the timed disintegration capsules sold as Spansules (SKF) has led to an extension of this type of sustained release medication. A new sulfonamide preparation Sul-Spansion (SKF) is a suspension of timed disintegration "spansules" of sulfaethylthiadiazole. An oral dose of this suspension every 12 hours provides a continuous antibacterial level in both blood and urine.

Another product involving a special coating procedure is Ecotrin (SKF). These are tablets of acetylsalicylic acid, coated to prevent disintegration in the stomach but to provide rapid release in the intestine. This product is particularly useful in those cases such as rheumatic fever requiring very high doses of acetylsalicylic acid. Ordinary tablets in such cases often cause gastric distress and gastritis which is often severe.

DRUGS AND TECHNIQUES USED IN RADIATION DAMAGE

By W. E. Smith *

THE handwriting has been on the wall for a half century, but man is only now waking up to the hazards of the cold, invisible fire he has loosed on the world in quantities which nature may not have intended. This "new fire" has always been with us, so far as we know, in the form of cosmic rays and other background radiation from certain minerals. We have ignored the "mountain sickness" which ran rampant among central Europeans who mined pitchblende and died from lung cancer, the tumors and bone cancers of workers in New Jersey who painted the first luminous clock and watch dials, touching the brushes to their lips to tip them, and the operators of early X-ray machines who used their own hands to check the intensity of the pictures on their fluoroscopes. These latter victims first noticed dermatitis, then cancer sores, and by 1911 fifty-four radiologists had died.

Radium appeared in the N. N. R. from 1915 to 1932, and was administered to thousands in doses as high as 1000 mcg. per injection. Most was eliminated but deposits formed in the bones and later produced aplastic anemias. Bone lesions also became prevalent in persons so treated. Osteogenic sarcoma has been reported in many cases where radium was given orally. Oral preparations are said to have been contaminated with thorium which apparently is responsible for the appearance of malignant lesions. The average interval between radium ingestion and death in 63 patients was reported by Looney and Colodzin (1) to be 25 years, and the interval between onset of symptoms due to tumors and death was four years. Early diagnosis and prompt amputation of involved extremities have saved many victims, but the long interval between deposition and onset of symptoms plus the variety of symptoms exhibited complicate the problem of diagnosis.

A sequel to this discovery was the discontinuing of the use of thorium dioxide sol in diagnostic hepatosplenography, popular from 1930 to 1945 (1). Thorium sol is retained in the reticuloendothelial

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system throughout life giving off alpha particles which may destroy the spleen and liver. In addition, aplastic anemias and leukemia have been observed due to thorium deposited in the bone marrow.

Considering that thousands of people alive today have had such radioactive materials in their bodies for many years, it is fortunate that modern medicine is being alerted to the various skeletal and hematolytic manifestations resulting from deposition of radioactive elements, and that means for measuring radiation from the body and for analyzing excreta are available. Even more important is the realization that too much care can not be exercised in initiating new therapeutic agents and procedures, especially where radioactive materials are concerned.

Only the spectacular destruction and loss of life caused by atomic bomb explosions shook man out of his complacency and uncovered the startling facts that point to a greater danger perhaps than the destructive power of nuclear weapons. Even now survivors of the Pacific bomb tests are being watched for development of cancer and radiation poisoning, and long-term genetic studies initiated on survivors of the original explosions in Japan are being followed through. As described in Pageant Magazine (2) we are faced with an invisible lethal force which cannot be sensed in any way and over a period that may vary from days to years produces slow death of the organism. Yes, the "death rays" of our science fiction literature have been with us all the while and it is our problem to regulate their constructive uses so that there may be future generations to enjoy the better life they should make possible.

Due to the complexity of the problem we shall attempt to deal only with techniques and agents developed to alleviate or protect living organisms from the effects of this silent killer which may strike down or cripple individuals generations from now. It is necessary to review some basic material and define a few relative terms in order to put across more clearly the action and effects of the menace we are dealing with.

We will need to know that radiation is measured in a number of ways and must in some way define quantities of radiation. As stated by Delario (3) a curie is the quantity of radon gas in radioactive equilibrium with one gram of radium. The International Radium Standard Commission has recommended the arbitrary value of 3.7×10^{10} total disintegrations per second per gram of radium, or 3.7 billion particules given off per second per gram. A roentgen is the

quantity of X or gamma radiation which causes enough ionization in one cubic centimeter of air to produce one electrostatic unit of electricity of either sign. As measured in practical work it is: the amount of ionization caused by one roentgen will cause a current of one ampere to flow through a one centimeter measuring chamber in one second. As a review, the three main types of harmful radiation encountered are: alpha particles or helium nuclei having great energy but little penetrating power due to their relatively large size, the beta particles or high-speed electrons, and the gamma rays, high frequency rays such as X-rays and cosmic radiation which have great penetrating power since they move with the speed of light and require a lead sheet from five centimeters up to stop their progress. Since one of our greatest defenses and treatments of radiation exposure is getting as much distance between ourselves and the source, we should be acquainted with the means for detecting and measuring these hazards which are available to us. So far the best detectors are gas-chamber instruments and photographic film. They are specialized into two groups: the ratemeters to determine the intensity of a source and the dosimeters which record total radiation to which they are exposed.

Of the first type, the Geiger-Müller counter is suited for low level radiation. Primarily used for measuring gamma radiation it can be adjusted to record the rate of both gamma and beta radiation. For higher intensity radiation a device called an ionization chamber is used. Film Badges or Pocket Dosimeters are necessary for persons who must go into contaminated areas or work in presence of radiation. A Pocket Dosimeter measures total gamma radiation absorbed directly on a scale and film badges must be developed like an X-ray to reveal the total radiation exposure.

The U. S. Department of Commerce through the National Bureau of Standards has published a pamphlet giving tables of "permissible" maximum exposure as well as large tables dealing with each radioactive isotope in use today, telling where it deposits in the body, its toxic effects, half-life and other facts. This pamphlet states (4) that individuals who must work under exposure to radiation should be limited to the following maximum weekly dose to the blood-forming organs, based on an extended source of radiation: X, Beta and gamma rays—0.3 r. per week, alpha radiation 0.015 r. per week. These values are questionable from the standpoint of recent conclusions of leading authorities that radiation from all sources is cumulative in effect on living organisms (2). As an individual one may see where

he stands by checking the values, in terms of radiation, of the number of X-rays he has had, of various types against the statements of members of the National Academy of Sciences that (2) ten roentgens is the limit one should receive by age thirty from man-made sources. In comparison the following values are listed (5) in terms of producing radiation damage in atomic bomb explosions: 25-100 r. produce some injury, non-incapacitating; 100-300 serious injury; 300-400 r. in a short time, probable death; and 500-600 r. result in certain death.

This brings us to the next consideration, the effects of radiation on an organism. Exposure to ionizing radiation manifests itself in three main types of injury depending on factors of: size of dose, size of tissue area irradiated, duration of exposure, intensity and wave length of the source (shorter wavelengths are more penetrating). Most cases may be clearly classified as radioactive poisoning, radiation sickness, or long-term genetic disturbances which we shall deal with shortly. There are a number of theories as to how these rays damage living organisms. The complete picture is far from clear but one theory has received quite a bit of experimental substantiation. Delario (6) describes formation of ions deep in the structure of the cell itself by penetrating radiations, which frequently knock off electrons from water and possibly other essential elements of tissue fluid or cell contents. These ions, thought to be H^+, OH^- and peroxides have oxidizing properties and are believed to inhibit some sulfhydryl-containing essential enzymes. Chapman, et al. (7) found that cysteine, glutathione, BAL, tocopherol and SH^- containing compounds decreased this action resulting in less weight loss and higher survival rate in irradiated test animals.

TABLE I

RADIATION EFFECT VS. PERMISSIBLE DOSE

Radiation	Relative Biological Effect	Maximum Dose Allowed to Blood-Forming Organs
X-rays and gamma	1	0.3r./week
beta	1	0.3r./week
alpha	20	0.015r./week

Before dealing with agents for alleviation of radiation damage let us review what has been observed and what is suspected about the problem. Radioactive poisoning usually results when the offending materials themselves gain entrance to the body due to accidental ingestion or chronic exposure to radioactive dust, drinking contaminated water, etc. Often no external manifestations appear, the substance being absorbed by the bones or blood-forming organs. Effects are mostly chronic and the victim may die years later.

Radiation sickness is illness produced by overexposure to penetrating ionizing radiations and neutrons in a relatively short period of time, such as in a bomb burst or cloud of fallout material. This type of injury has been studied in detail and the clinical syndrone is excellently described by Oughterson and Warren (8). Humans receiving heavy doses of radiation first exhibit severe weakness, prostration and shock and die in a few hours. Those with less severe exposure will show the following symptoms usually in the order given: nausea, vomiting and anorexia appear in 30 minutes to three hours. Pain, if present, is due to other injury, and patient is apathetic if lucky enough not to go into shock. Spontaneous hemorrhage appears, purpura on skin areas, bleeding from the mouth, rectum, respiratory passages and hematuria are to be expected. Damage to intestinal mucosa brings on typical watery then bloody diarrhea, paving the way for bacteremia and general infection. Decreased leucocyte count invariably appears before second day following exposure and individuals surviving the first week exhibit anemia due to failure of reticuloendothelial and erythrocyte forming systems, plus the loss of blood. Red blood cells and hemoglobin are both reduced, number of platelets is lowered and capillary permeability is increased. Those victims surviving to the sixth week are expected to recover and a good indication of this prospect is the rebound of white blood cell count at the end of the first week to levels slightly higher than normal. Epilation appears abruptly about two weeks after exposure and lasts one or two weeks. If victim survives hair growth returns six to ten weeks after exposure, that on the head reported often as white. Procedures recommended in cases of exposure to high intensity radiation include: immediately seek the best protection in the immediate vicinity such as a concrete wall or ditch, cover the mouth and nose to prevent breathing particles using anything from a handkerchief to a gas mask. After exposure, if not incapacitated, one should get checked by a monitor,

shower thoroughly with abrasive soap and get rid of all clothes exposed. Medical treatment consists of selecting those with leucocyte counts above 2000 per cu.mm. for transfusions of whole blood. Penicillin, streptomycin and sulfonamides may be given to ward off infection and hematinics and blood coagulants as needed in hemorrhage are administered.

Gonadal effects reported in incomplete studies showed temporary sterility in many cases and high incidence of abnormal terminations of pregnancy. Oughterson and Warren (9) cite data showing 45 of 177 women attended during the three months following the Japanese explosions at the close of World War II were affected with abortions and miscarriages.

Recent reports from British literature (10) suggest that exposing children to X-rays during their prenatal life may be an important factor in causing leukemia in infancy and childhood. Past histories of children who died from leukemia or malignant disease prior to age ten during the years 1953 to 1955 were compared to those of an equal number of control children. A significant excess of deaths was found among children of mothers who had been subjected to X-ray examination of the abdomen during pregnancy. No similar excess was found among children who were post-natally subjected to diagnostic X-ray studies. This led to the assumption that the foetus may be more sensitive to leukemogenic effects of radiation then either the child or adult. Suggestions were made that image intensifiers be developed and used to lower intensity of radiation necessary for diagnostic procedures, and that "adequate justification" be required, especially for abdominal examinations during pregnancy.

Medical studies (11) revealed radiation affects species, organs, and cells in selective manner, and a more thorough examination of the subject may aid experimentation. Information points to the guinea pig and rat as being much more sensitive to radiation than man and to the goat and fish to be the least sensitive of all. In decreasing order of sensitivity some of the body structures affected are: lymph glands, bone marrow, testes and ovaries. The brain and other highly organized cell tissues are particularly resistant to damage. Cells are especially vulnerable during mitosis and those of the blood-forming structures are highly susceptible to damage; in general all cells becoming less sensitive as they mature.

This leaves the third type of damage to be explored. A report published in "Science" recently (12) summed up this aspect of the problem. The authors are unanimous in arguing the nature of the effects of high energy radiations upon the genetic material is universally the same in principle since the chemical nature of this material is the same from bacteria to man, and the pattern of hereditary transmission the same for all sexually reproducing organisms. There is no "minimum dose" of radiation below which no harmful effects appear! Energy furnished by radiation reaches deep into the units of cell structure causing ionizations and changes in colloidal particles, the foundation of protoplasm. It has been shown to slow cell division, cause splitting of or even loss of one set of chromosomes in somatic and germ cells. In experiments with mice (13) Delario reports 32 r. doses were found to double mutation rates and on this basis he estimates 30 to 80 r. doses would double the rate in man. The report concludes radiations produce or increase such mutations which affect each gene independently and once changed it is transmitted to succeeding generations in the new form. In the vast majority of cases mutations resulted in some harmful effect including death and sterility. Fortunately, most are recessive in nature and so carried on masked by a dominant trait, the first generation not usually being effected. But since certain defects are caused by a single damaged or mutant gene we may find dwarf babies, hemophilia, and manic depressives on the increase in our descendants. Also if the mutation rate becomes too high evolution may become handicapped and natural selection choked off due to production of overwhelming numbers of unfavorable characteristics. Already man's mastery of his environment has decreased the severity of natural selection through advances in medicine, nutrition and sociology. Spontaneous mutations (caused by heat, cosmic rays, natural radiation) provide sufficient variations to advance the evolution process. Genetic dosage by radiation makes a so-called "safe rate" impractical if one considers the effect on future generations. Recommendations must be set up for controlling radiation consistent with the needs of national defense and peacetime power requirements. These should provide for making sure the general public does not receive ten roentgens of man-made radiations to the reproductive cells exclusive of background radiation during the period of life from birth to thirty years of age. Taking this period as the

average span of a generation Table II (14) is of interest. Three to four roentgens of this ten will necessarily be reserved for X-ray procedures which nearly every one requires at some time. Perhaps two problems may be solved by giving capable elderly persons desiring to remain employed the preference for jobs in occupations requiring exposure to a certain degree of risk. Danger of their transmitting a bad effect of radiation is slight and a large part of our forced retirements may be gainfully employed.

Now that we have covered many of the problems let us try to evaluate the progress in agents and processes which may aid in solving them. The first consideration is; can any degree of protection be achieved? Protection from alpha and beta particles could be well taken care of by covering the body with special clothing and possibly skin creams, and wearing masks or devices to avoid ingestion of particles. Rowe (15) found the pulp and fresh rind of *Aloe vera* yielded a juice promoting healing of experimentally produced third degree burns in white rats exposed to radiation and sodium bicarbonate solutions may be used to treat the same conditions of the skin.

As noted before, the highly penetrating gamma and X-rays are the main offenders. Recent investigations (16) indicate several sulfhydryl compounds injected just before irradiation were found to protect 20 to 90% of test animals from LD_{100} X-rays. Cysteine was used on mice and rats and glutathione on mice, rats and dogs. The LD_{50} of whole body radiation was determined to range from 275 r. for pigs to 800 r. for rabbits; with man the value was estimated to be around 450 r. Three possible theories may explain

TABLE II

ROENTGENS RECEIVED FROM SINGLE ROUTINE X-RAY DIAGNOSTIC PROCEDURES

Chest 14 x 17"	0.1r.
Chest, fluoroscopy	1.0r.
Pregnancy, lateral	9.0r.
G. I. Series	4.0 to 5.0r.
Dental Film	1.0 to 4.0r.
Fluoroscopy	10.0 to 20.0r/min.
Shoe-fitting fluoroscopy	1.0 to 2.0r./5 sec. exposure

the mechanism of protection exhibited by these sulfhydryl compounds. First, they may act as strong reducing agents thus preventing the formation of oxidizing ions which inactivate enzymes by changing the SH⁻ group to ⁻S⁻S⁻. Second, the enzymes having active SH⁻ groups may be protected by the competition of substances like glutathione and BAL for the radiotoxins. Third, it is possible that these compounds act as protectives by combining with the vulnerable enzymes.

Anoxia may be another key to blocking radiation effects. The presence of oxygen may alter the radiation chemistry of water increasing the actions of ions produced when gamma rays penetrate the cell structure. Oxygen may also alter the state of some enzymes and thus affect their sensitivity to damage. In any case, drugs producing anoxia may depress the active ion formation. Experiments have been reported in which methemoglobin-producing agents such as p-aminopropiophenone given in amounts which convert about 30-40% of blood hemoglobin caused removal of enough oxygen to protect the subject from radiation damage. Compounds unrelated to those listed above are reported as acting to protect mice from radiation when given in near toxic doses. Among these are substances such as adrenalin, histamine and beta phenylethylamine. Van Beckkum and DeGroot (17) believe they act as anoxia producers resulting from disturbances of circulation.

Ellinger, however, in "Radiology" (18) worked along slightly different lines and came up with some statements contradictory to the latest report summarized in the preceeding paragraphs. This theory suggested irradiation produced adrenal cortex insufficiency and disturbances of salt, water, and cholesterol metabolism. He also reported a histamine-like substance, if not histamine itself, is liberated in irradiated patients and laboratory animals. He claims prolonged administration of histamine produces symptoms similar to those seen in radiation sickness including changes in the liver. To this end he gave desoxycortico-sterone acetate and found it effective in preventing radiation sickness in rats in a dosage of 5 mg. intramuscularly every eight hours for three doses and repeating every three to five days. Some rats suffered brain lesions from overdose. ACTH given ten mg. daily or three times weekly relieved symptoms of radiation exposure and Dramamine was effective given 100 mg. one hour before treatment, 1½ to 2 hours after and 3 to 4 hours later.

These results are encouraging but cysteine and glutathione must be given in near toxic doses to raise the lethal dose even 50%. Lead shielding of large areas of bone marrow appears to reduce deaths from leucopenia and blood damage but one investigator found high incidence of tumors in the rats protected by chemicals or lead shields.

The effects of radiation on typical drugs were described in a recent paper by Lang (19). After exposure to atomic radiation and bomb blasts at varying distances, darkening of clear glass containers was noted as a warning of heavy exposure. Most of the radiation activity resided in the glass container itself but a few samples showed significant activity residing in the drug. Among these were Methantheline Bromide, Phenobarbital, Thiopental Sodium, Prantal, Sulfadiazine and Aureomycin. Sometimes this was due to calcium phosphate excipient and sometimes to the change in atoms in the drug such as production of Bromine 82, with a half-life of thirty-four hours and Sodium 24 with a half-life of fifteen hours. The longest half-life exhibited was that of Prantal containing Sulfur 35 (eighty-seven days).

Mineral ash content nearly always indicates radioactivity may be expected in exposed drugs. The inorganic excipients such as calcium phosphate show high production of radioactivity compared to organic diluents such as lactose. In general, all drugs containing chlorine will become radioactive by virtue of formation of Sulfur 35. This means that most fluids for parenteral use such as dextrose-salines, Dextran and P. V. P. may be expected to show radioactivity of the same duration and intensity. It is plain that the hazard involved in administering or ingesting these substances within one week after their exposure must be balanced against the necessity for treatment in extreme emergencies. Potency was not affected on such typical products as antibiotics, Digifolin, vitamin D, epinephrine and benzalkonium chloride, but vitamin B_{12} changed color and its potency was reduced up to 50% and insulin was darkened with its activity being reduced about 10% in most cases.

The top scientific bodies of the United States and Great Britain have set these facts before the public and have made recommendations which would presumably reduce the danger until precise values are established as to what is safe and what is harmful to man and to future generations. Then laws for control may be proposed to resolve a problem which was a main topic of discussion between the

major candidates in the past election. Some recommendations suggested (20) were reduction of medical and other uses of X-rays, adoption of strict regulations for proper construction of nuclear power plants and supervision of disposal of radioactive wastes. Reduce testing of atomic weapons and radioactive fallout to the bare minimum, was urged and eliminating other sources of human exposure such as fluoroscopy for fitting shoes and chemistry sets which provide youngsters with "genuine radioactive minerals." It is not far-fetched to suppose that too many hours spent in our new national pastime, sitting hypnotized before our television set, may add to the damage being caused by radiation from other sources.

Regardless of politics, those who lead our country in the near future must develop some sort of balance between these scientific facts and the needs of our national defense policy. If not we may keep this generation at peace only to turn over the world at some later date to the fish and rabbits who seem to have a high resistance to this nature's "cold fire."

BIBLIOGRAPHY

(1) Looney, W. B. and Colodzin, M., *J. Amer. Med. Assn., 160:*1 (1956).
(2) *Pageant,* Nov. 1956, pp. 8-25.
(3) Delario, *Roentgen, Radium, and Radio-isotope Therapy,* Ch. 6, pp. 34-35.
(4) U. S. Dept. of Commerce, Nat. Bureau of Standards, Handbook No. 52, *Maximum Permissible Amounts of Radioisotopes in the Human Body and Maximum Permissible Concentrations in Air and Water.*
(5) Handbook of the Hospital Corps, U. S. Navy, (1953) Ch. XIII, *Medical Aspects of Atomic Warfare.*
(6) Delario, see ref. (3), Ch. 10.
(7) Chapman, *et al., J. Amer. Med. Assn. 131,* 86, 1946.
(8) Oughterson and Warren, *Medical Effects of the Atomic Bomb in Japan.*
(9) See ref. (8), p. 127.
(10) Steward, A., Webb, J., Gile, D. and Hewitt, D., *Lancet 2,* 447 (1956).
(11) See ref. (5).
(12) Report by Committee on Genetic Effects of Atomic Radiation, Nat. Academy of Sciences, Science June 29, 1956, pp. 1157-65.
(13) Delario, see ref. (3), Ch. 9.
(14) *Pageant,* Nov. 1956, p. 17.
(15) Rowe, *J. Amer. Phar. Assn.* (Sc.) *30, 226* (1941).
(16) *British Med. Journal, Chemical Protection Against Radiation,* 15 Sept. 1956, p. 647.
(17) VanBekkum and DeGroot, *Progress in Radiobiology,* Proceedings of Fourth International Congress on Radiobiology held in Cambridge, 1955.
(18) Ellinger, *Radiobiology 50,* 234 (1948).
(19) Lang, Edw. P., *J. Amer. Phar. Assn.* (Sc.) *45,* 357-63 (1956).
(20) See ref. (12).

SELECTED ABSTRACTS

Topical Steroid Therapy Among Elderly Patients. Irke, R. E., and Griffin, J. P. *J. Am. Geriat. Soc. 4*:1004 (1956). A group of 60 elderly patients, between the ages of 60 and 90, were treated by the topical application of hydrocortisone preparations. The average age of the group was 66 years. The types of inflammatory skin conditions encountered among the patients were lichen simplex chronicus, anogenital pruritus, prolonged contact dermatitis, seborrheic dermatitis, stasis dermatitis, eczematoid dermatitis, dishidrosis, and nummular eczema.

The preparations studied contained a fixed amount of neomycin but they varied from 0.5 to 2.5 per cent in the hydrocortisone content. The preparations were available in the forms of ointments, lotions, and creams. Paired comparisons were made simultaneously in many cases with preparations of different strength, with the vehicle or base, and with common preparations such as ammoniated mercury and boric acid ointments.

It had long been felt that the senile skin did not absorb medication as well as the skin of younger persons. The results obtained with these patients were compared, therefore, with similar studies with younger patients, all under the direction of the authors. It was found that the lesions in the elderly patients responded well to the medication, particularly to a concentration of 2.5 per cent hydrocortisone. The response to therapy among the elderly patients was found to be better than that among younger patients, as evidenced by a higher improvement and cure rate. The authors did not find that one vehicle had a marked superiority over another.

The Topical Application of Amphomycin and Amphomycin-Neomycin Ointments. Cronk, G. A., and Naumann, D. E. *Antibiot. Med. & Clin. Ther. 3*:142 (1956). The antibiotic amphomycin was employed in the form of its calcium salt in an ointment containing 5.0 mg. per Gm. A second ointment was also used containing 5.0 mg. per Gm. of calcium amphomycin and 5.0 mg. per Gm.

of neomycin. The ointments were applied twice a day to diseased skin areas of 28 patients. The diseases treated were acne vulgaris, impetigo, one infected cyst, and dermatitis.

Prompt improvement was observed in 6 of 8 cases of impetigo and in the two cases with dermatitis. However, none of 17 patients with acne vulgaris showed improvement. The authors felt that the poor results in the latter cases may have been due to poor access of the ointment to the bacteria in the lesions. No evidence of skin sensitization nor irritation from either of the ointments was observed, even though treatment was continued for as long as 60 days, in four patients. No significant difference in efficacy was observed between the two ointments.

The *in vitro* activity of amphomycin against several different strains of bacteria was also investigated. The results were presented in tabular form. It was found that nutrient broth required relatively high concentrations of amphomycin to inhibit most of the bacteria studied. However, by the substitution of a more complex solid media the concentration could be reduced from 100 to 200 times in order to obtain inhibition of the same organisms. The bacterial strains employed were isolated from the lesions of the patients treated or from other clinical cases. *Pseudomonas aeruginosa* and Proteus strains were among the least sensitive to the antibiotic.

The Effect of Constituent Concentration on Emulsion Consistency. Axon, A. *J. Pharm. Pharmacol. 8:762* (1956). A variable speed rotational viscometer was used to determine the consistency of a series of oil-in-water emulsions. The emulsions contained from 15 to 40 per cent liquid petrolatum, from 2 to 10 per cent cetyl alcohol, from 0.2 to 1.0 per cent sodium lauryl sulfate, and from 0 to 3 per cent bentonite. Two values were determined, the plastic viscosity in poises at 200 r.p.m. and the yield value in dynes per sq. cm. at 200 r.p.m.

The values obtained confirmed the generally recognized descriptive evaluations. It was found that the consistency of the emulsion was increased more readily by increasing the amount of the oil than by increasing the emulsifying agent, sodium lauryl sulfate. Thus, both plastic viscosity and yield values were increased more readily by increasing the amount of the oil. It was also found that the

consistency was increased to a greater degree by cetyl alcohol than by similar increments in liquid petrolatum.

A relation was observed by the author between the common descriptive term "body" and the quantitative value, yield value. Since the yield value is the force in dynes per sq. cm. which must be applied before streamline flow begins, it is also a resistance to deformation. The results bore out this relationship.

Some of the emulsions were autoclaved and some were not. All of the unautoclaved emulsions showed thixotropic shear-rate thinning. this type of flow was thought to be due to a dispersion of the globules in the emulsion or, at most, flocculation into loose, unconnected aggregates. All of the autoclaved emulsions containing from 1 to 3 per cent bentonite showed plastic flow. This type of flow was thought to be due to the formation of an interlinked structure of flocculated globules within a gel network.

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